

ALPHABETICAL LISTING OF THE ELEMENTS

| Element | Symbol | Atomic Number | Element | Symbol | Atomic Number | Element | Symbol | Atomic Number |
|--------------|--------|---------------|-------------|--------|---------------|---------------|--------|---------------|
| Actinium | Ac | 89 | Gold | Au | 79 | Praseodymium | Pr | 59 |
| Aluminum | Al | 13 | Hafnium | Hf | 72 | Promethium | Pm | 61 |
| Americium | Am | 95 | Hassium | Hs | 108 | Protactinium | Pa | 91 |
| Antimony | Sb | 51 | Helium | He | 2 | Radium | Ra | 88 |
| Argon | Ar | 18 | Holmium | Ho | 67 | Radon | Rn | 86 |
| Arsenic | As | 33 | Hydrogen | H | 1 | Rhenium | Re | 75 |
| Astatine | At | 85 | Indium | In | 49 | Rhodium | Rh | 45 |
| Barium | Ba | 56 | Iodine | I | 53 | Roentgenium | Rg | 111 |
| Berkelium | Bk | 97 | Iridium | Ir | 77 | Rubidium | Rb | 37 |
| Beryllium | Be | 4 | Iron | Fe | 26 | Ruthenium | Ru | 44 |
| Bismuth | Bi | 83 | Krypton | Kr | 36 | Rutherfordium | Rf | 104 |
| Bohrium | Bh | 107 | Lanthanum | La | 57 | Samarium | Sm | 62 |
| Boron | B | 5 | Lawrencium | Lr | 103 | Scandium | Sc | 21 |
| Bromine | Br | 35 | Lead | Pb | 82 | Seaborgium | Sg | 106 |
| Cadmium | Cd | 48 | Lithium | Li | 3 | Selenium | Se | 34 |
| Calcium | Ca | 20 | Lutetium | Lu | 71 | Silicon | Si | 14 |
| Californium | Cf | 98 | Magnesium | Mg | 12 | Silver | Ag | 47 |
| Carbon | C | 6 | Manganese | Mn | 25 | Sodium | Na | 11 |
| Cerium | Ce | 58 | Meitnerium | Mt | 109 | Strontium | Sr | 38 |
| Cesium | Cs | 55 | Mendelevium | Md | 101 | Sulphur | S | 16 |
| Chlorine | Cl | 17 | Mercury | Hg | 80 | Tantalum | Ta | 73 |
| Chromium | Cr | 24 | Molybdenum | Mo | 42 | Technetium | Tc | 43 |
| Cobalt | Co | 27 | Neodymium | Nd | 60 | Tellurium | Te | 52 |
| Copper | Cu | 29 | Neon | Ne | 10 | Terbium | Tb | 65 |
| Curium | Cm | 96 | Neptunium | Np | 93 | Thallium | Tl | 81 |
| Darmstadtium | Ds | 110 | Nickel | Ni | 28 | Thorium | Th | 90 |
| Dubnium | Db | 105 | Niobium | Nb | 41 | Thulium | Tm | 69 |
| Dysprosium | Dy | 66 | Nitrogen | N | 7 | Tin | Sn | 50 |
| Einsteinium | Es | 99 | Nobelium | No | 102 | Titanium | Ti | 22 |
| Erbium | Er | 68 | Osmium | Os | 76 | Tungsten | W | 74 |
| Europium | Eu | 63 | Oxygen | O | 8 | Uranium | U | 92 |
| Fermium | Fm | 100 | Palladium | Pd | 46 | Vanadium | V | 23 |
| Fluorine | F | 9 | Phosphorus | P | 15 | Xenon | Xe | 54 |
| Francium | Fr | 87 | Platinum | Pt | 78 | Ytterbium | Yb | 70 |
| Gadolinium | Gd | 64 | Plutonium | Pu | 94 | Yttrium | Y | 39 |
| Gallium | Ga | 31 | Polonium | Po | 84 | Zinc | Zn | 30 |
| Germanium | Ge | 32 | Potassium | K | 19 | Zirconium | Zr | 40 |

RADIOACTIVITY SYMBOLS

| | | |
|---------------------------------|------------------------------|----------------|
| ${}^4_2\alpha, {}^4_2\text{He}$ | ${}^0_{-1}\beta, {}^0_{-1}e$ | ${}^0_0\gamma$ |
| 1_0n | ${}^1_1p, {}^1_1\text{H}$ | |

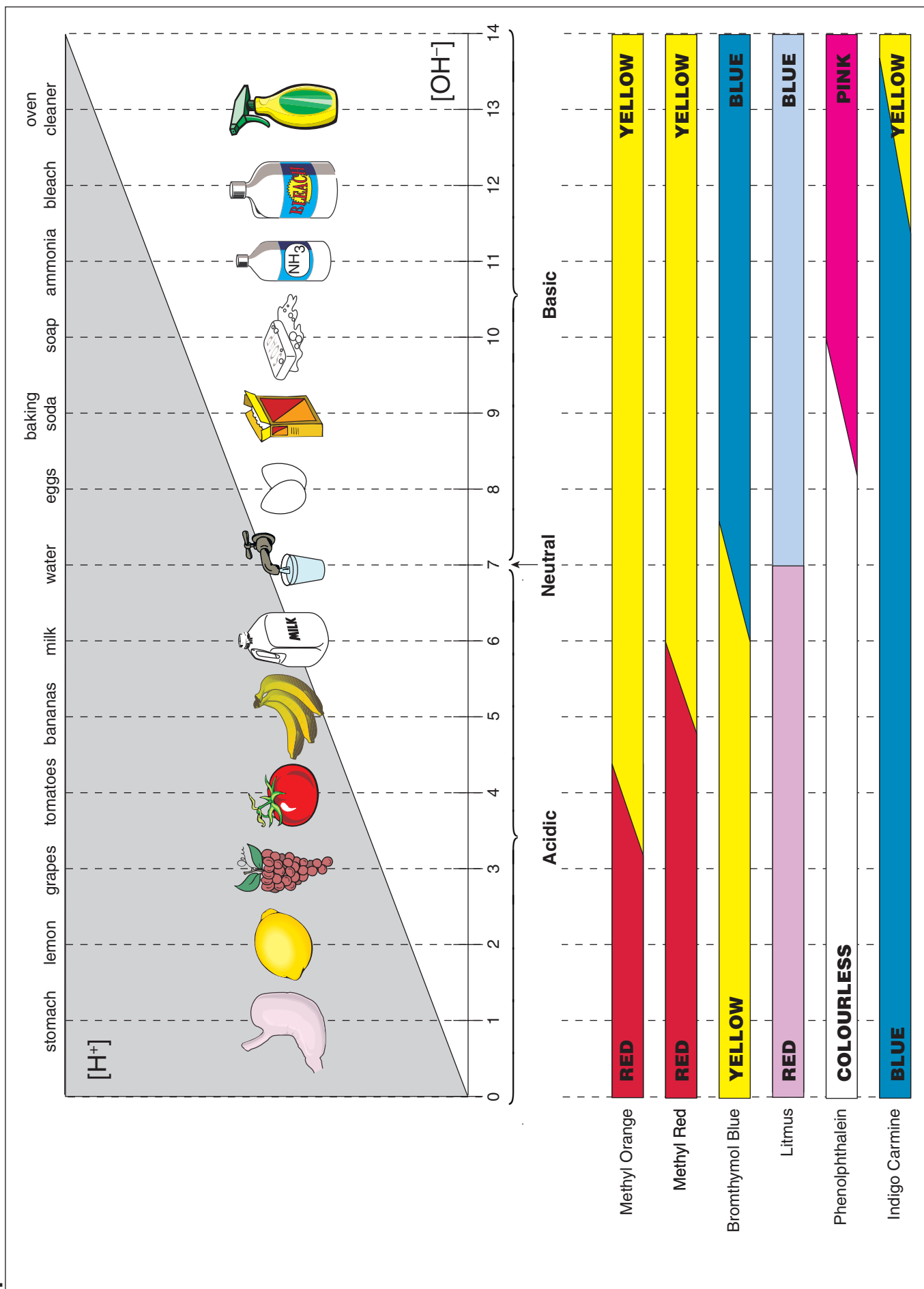
PERIODIC TABLE OF THE ELEMENTS

| | | | | | | | | | | | | | | | | | |
|--|----------------------------------|-------------------------------|--------------------------------|-----------------------------------|------------------------------------|-----------------------------------|---------------------------------|----------------------------------|------------------------------------|------------------------------------|-----------------------------------|----------------------------------|-----------------------------------|----------------------------------|---------------------------------|----------------------------------|-----------------------------------|
| 1 H Hydrogen 1.0 | 2 He Helium 4.0 | NON-METALS | | | | | | | | | | | | | | | |
| METALS | | | | | | | | | | | | | | | | | |
| <div>Atomic Number</div> <div>Symbol</div> <div>Name</div> <div>Atomic Mass</div> <div>Ion charge(s)</div> <div>Ti</div> <div>Titanium</div> <div>47.9</div> | | | | | | | | | | | | | | | | | |
| 3 Li Lithium 6.9 | 4 Be Beryllium 9.0 | 5 B Boron 10.8 | 6 C Carbon 12.0 | 7 N Nitrogen 14.0 | 8 O Oxygen 16.0 | 9 F Fluorine 19.0 | 10 Ne Neon 20.2 | 11 Na Sodium 23.0 | 12 Mg Magnesium 24.3 | 13 Al Aluminum 27.0 | 14 Si Silicon 28.1 | 15 P Phosphorus 31.0 | 16 S Sulphur 32.1 | 17 Cl Chlorine 35.5 | 18 Ar Argon 39.9 | 19 K Potassium 39.1 | 20 Ca Calcium 40.1 |
| 21 Sc Scandium 45.0 | 22 Ti Titanium 47.9 | 23 V Vanadium 50.9 | 24 Cr Chromium 52.0 | 25 Mn Manganese 54.9 | 26 Fe Iron 55.8 | 27 Co Cobalt 58.9 | 28 Ni Nickel 58.7 | 29 Cu Copper 63.5 | 30 Zn Zinc 65.4 | 31 Ga Gallium 69.7 | 32 Ge Germanium 72.6 | 33 As Arsenic 74.9 | 34 Se Selenium 79.0 | 35 Br Bromine 79.9 | 36 Kr Krypton 83.8 | 37 Rb Rubidium 85.5 | 38 Sr Strontium 87.6 |
| 39 Y Yttrium 88.9 | 40 Zr Zirconium 91.2 | 41 Nb Niobium 92.9 | 42 Mo Molybdenum 95.9 | 43 Tc Technetium (98) | 44 Ru Ruthenium 101.1 | 45 Rh Rhodium 102.9 | 46 Pd Palladium 106.4 | 47 Ag Silver 107.9 | 48 Cd Cadmium 112.4 | 49 In Indium 114.8 | 50 Sn Tin 118.7 | 51 Sb Antimony 121.8 | 52 Te Tellurium 127.6 | 53 I Iodine 126.9 | 54 Xe Xenon 131.3 | 55 Cs Cesium 132.9 | 56 Ba Barium 137.3 |
| 87 Fr Francium (223) | 88 Ra Radium (226) | 89 Ac Actinium (227) | 90 Th Thorium 232.0 | 91 Pa Protactinium 231.0 | 92 U Uranium 238.0 | 93 Np Neptunium 237 | 94 Pu Plutonium 244 | 95 Am Americium 243 | 96 Cm Curium 247 | 97 Bk Berkelium 247 | 98 Cf Californium 251 | 99 Es Einsteinium 252 | 100 Fm Fermium 257 | 101 Md Mendelevium 258 | 102 No Nobelium 259 | 103 Lr Lawrencium 262 | 104 Rf Rutherfordium 261 |
| 105 Db Dubnium (262) | 106 Sg Seaborgium (263) | 107 Bh Bohrium (262) | 108 Hs Hassium (265) | 109 Mt Meitnerium (266) | 110 Ds Darmstadtium (281) | 111 Rg Roentgenium (272) | 112 Uub Ununbium (285) | 113 Uut Ununtrium (284) | 114 Uuq Ununquadium (289) | 115 Uup Ununpentium (288) | 116 Uuh Ununhexium (292) | 117 Uus Ununseptium (?) | 118 Uuo Ununoctium (294) | 119 Uuh Ununhennium (?) | 120 Uuo Ununnilium (?) | 121 Uuh Ununhennium (?) | 122 Uuo Ununnilium (?) |
| Alkali Metals | | | | | | | | | | | | | | | | | |
| Alkaline Earth Metals | | | | | | | | | | | | | | | | | |
| Halogens | | | | | | | | | | | | | | | | | |
| Noble Gases | | | | | | | | | | | | | | | | | |

Based on mass of C-12 at 12.00.

Any value in parentheses is the mass of the most stable or best known isotope for elements which do not occur naturally.

pH SCALE



NAMES, FORMULAE AND CHARGES OF SOME POLYATOMIC IONS

| Positive Ions | Negative Ions | | |
|---------------------------------------|---|---|--|
| NH ₄ ⁺ Ammonium | CH ₃ COO ⁻ Acetate | HCO ₃ ⁻ Hydrogen carbonate, bicarbonate | NO ₂ ⁻ Nitrite |
| | CO ₃ ²⁻ Carbonate | HSO ₄ ⁻ Hydrogen sulphate, bisulphate | ClO ₄ ⁻ Perchlorate |
| | ClO ₃ ⁻ Chlorate | HS ⁻ Hydrogen sulphide, bisulphide | MnO ₄ ⁻ Permanganate |
| | ClO ₂ ⁻ Chlorite | HSO ₃ ⁻ Hydrogen sulphite, bisulphite | PO ₄ ³⁻ Phosphate |
| | CrO ₄ ²⁻ Chromate | OH ⁻ Hydroxide | PO ₃ ³⁻ Phosphite |
| | CN ⁻ Cyanide | ClO ⁻ Hypochlorite | SO ₄ ²⁻ Sulphate |
| | Cr ₂ O ₇ ²⁻ Dichromate | NO ₃ ⁻ Nitrate | SO ₃ ²⁻ Sulphite |

PREFIXES

| | |
|----|-------|
| 1 | mono |
| 2 | di |
| 3 | tri |
| 4 | tetra |
| 5 | penta |
| 6 | hexa |
| 7 | hepta |
| 8 | octa |
| 9 | nona |
| 10 | deca |

COMMON ISOTOPE PAIRS CHART

| Isotope | | Half-life of Parent (years) |
|--------------|--------------|-----------------------------|
| Parent | Daughter | |
| Carbon-14 | Nitrogen-14 | 5730 |
| Uranium-235 | Lead-207 | 710 million |
| Potassium-40 | Argon-40 | 1.3 billion |
| Uranium-238 | Lead-206 | 4.5 billion |
| Thorium-235 | Lead-208 | 14 billion |
| Rubidium-87 | Strontium-87 | 47 billion |

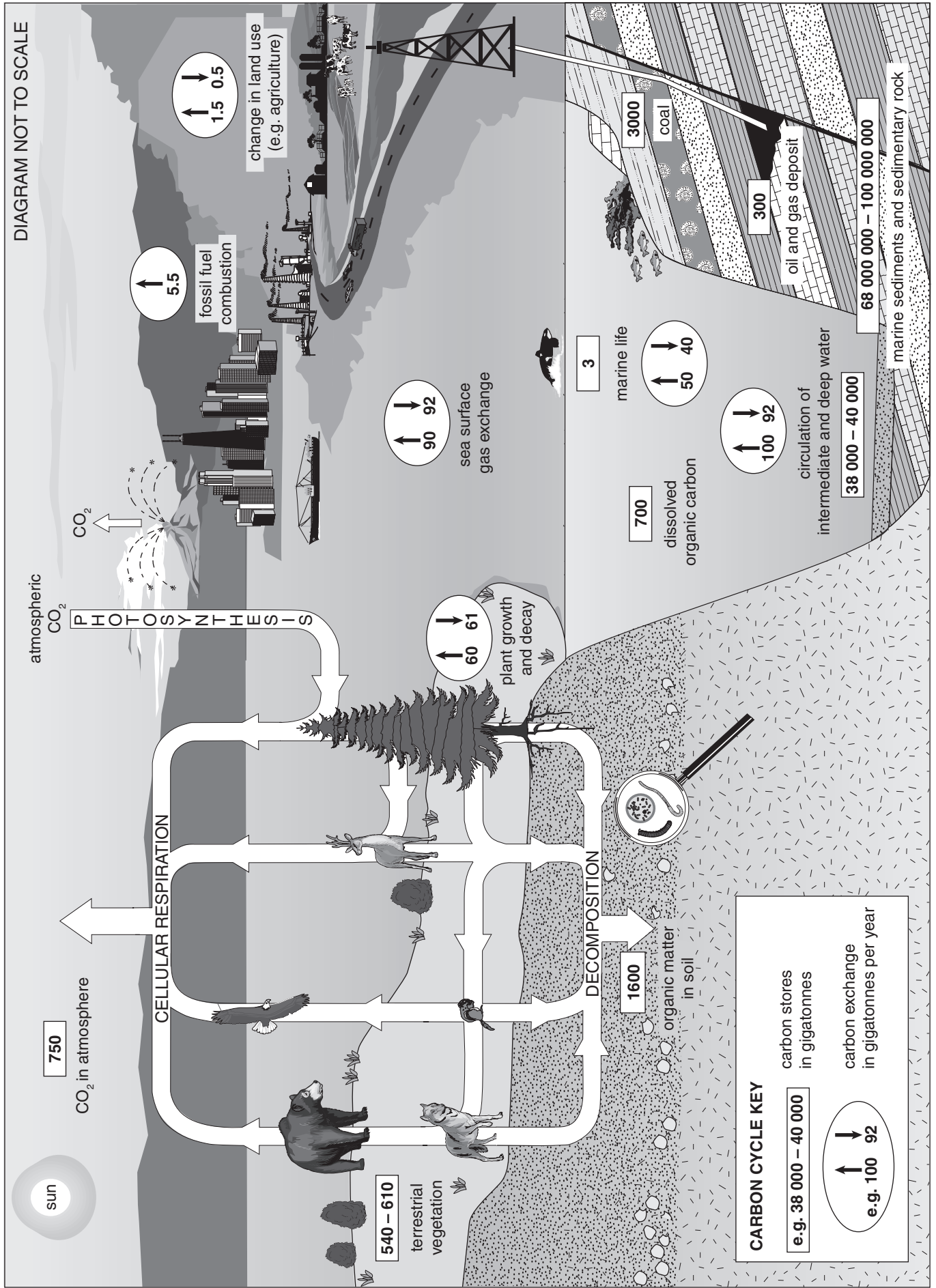
UNITS AND ABBREVIATIONS

| Quantity | Unit | Symbol |
|--------------|--------|--------|
| distance (d) | metre | m |
| time (t) | second | s |
| | minute | min |
| | hour | h |
| | year | a |

EQUATIONS OF MOTION

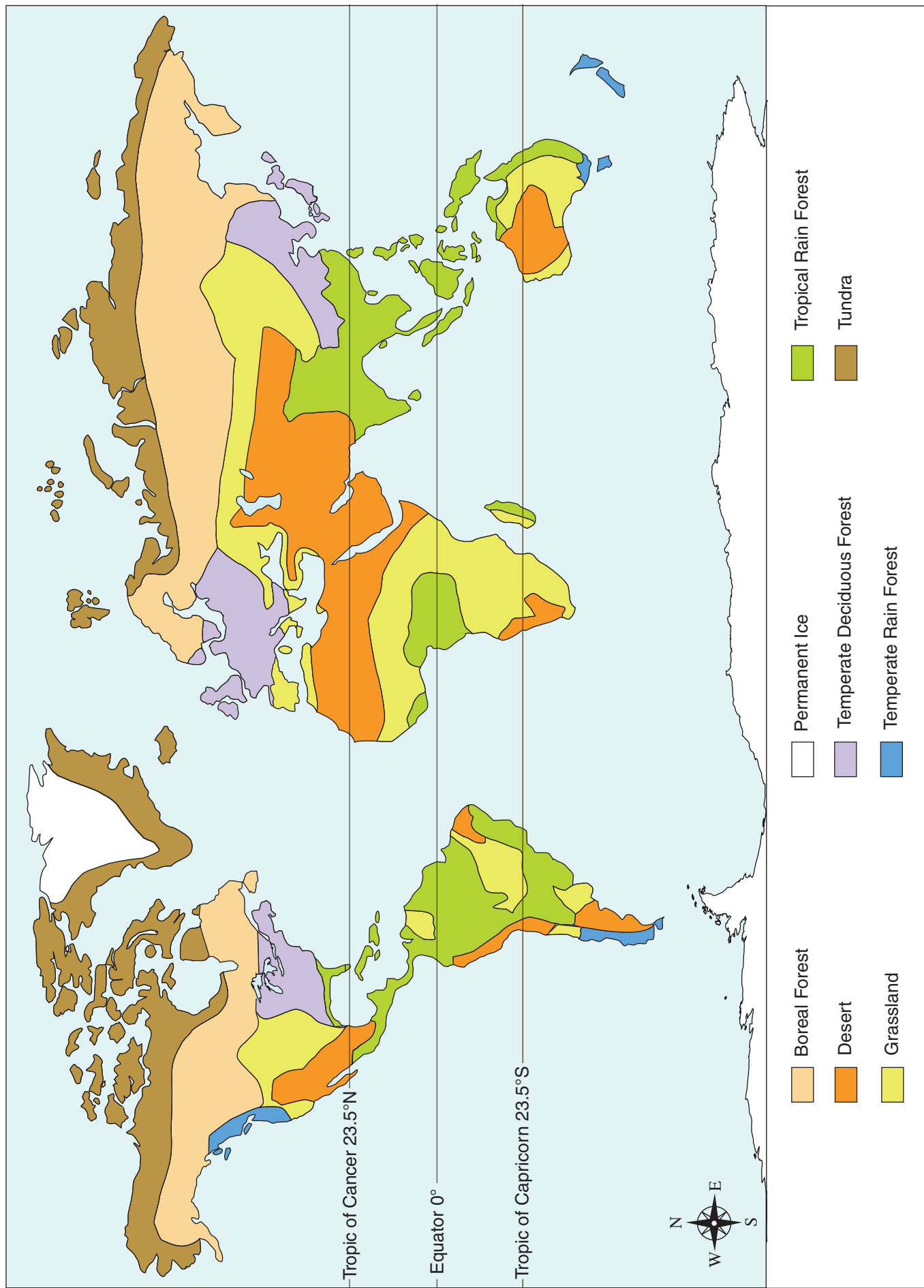
| | | |
|--|---|--|
| $v_{av} = \frac{\Delta d}{\Delta t}$ $\Delta d = v_{av} \Delta t$ $\Delta t = \frac{\Delta d}{v_{av}}$ | $a = \frac{\Delta v}{\Delta t}$ $\Delta v = a \Delta t$ $\Delta t = \frac{\Delta v}{a}$ | $\Delta v = v_f - v_i$ $v_i = v_f - \Delta v$ $v_f = v_i + \Delta v$ |
|--|---|--|

THE CARBON CYCLE



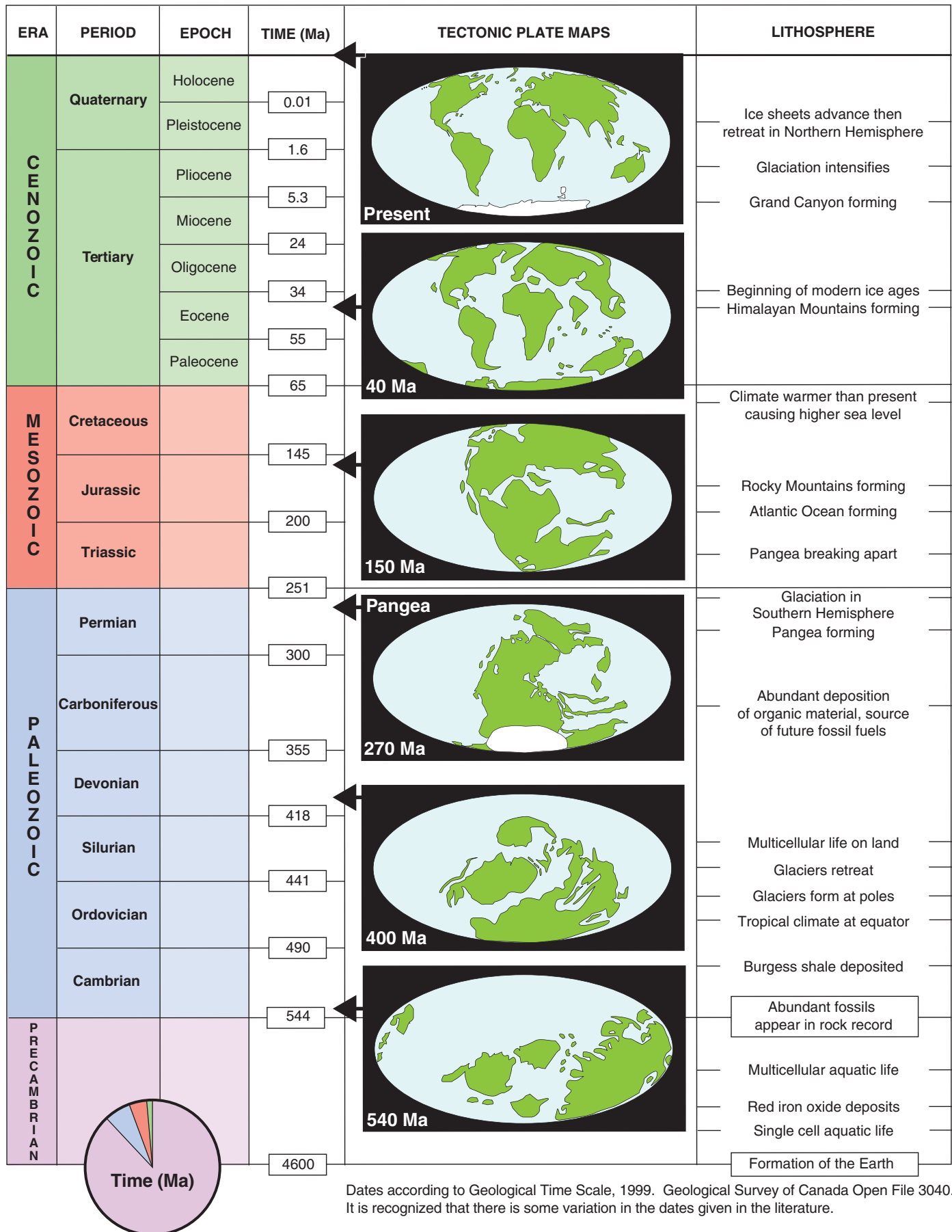
Different sources will provide varying information.

BIOMES OF THE WORLD

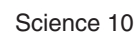


Different sources will provide varying information.

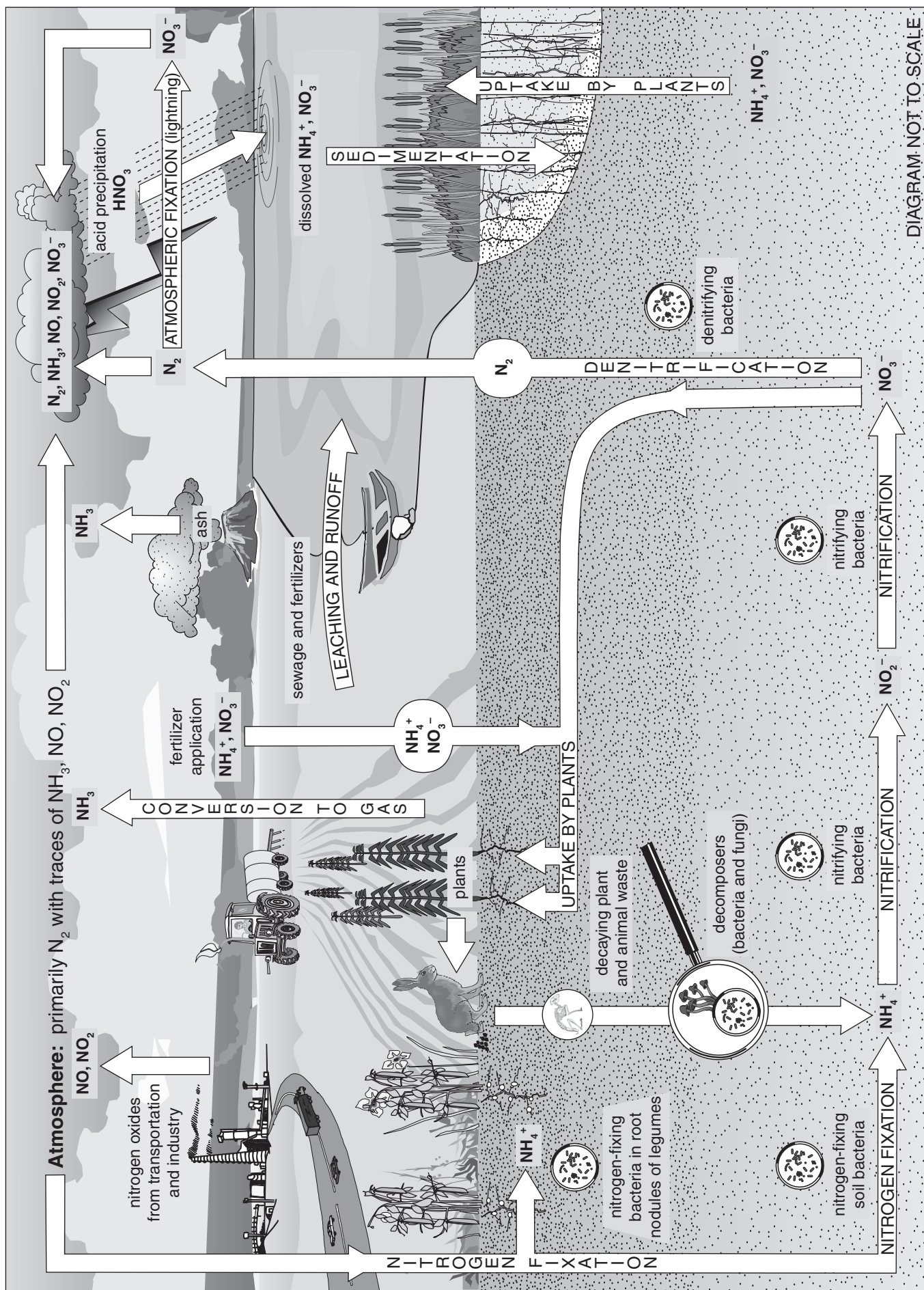
GEOLOGICAL TIME



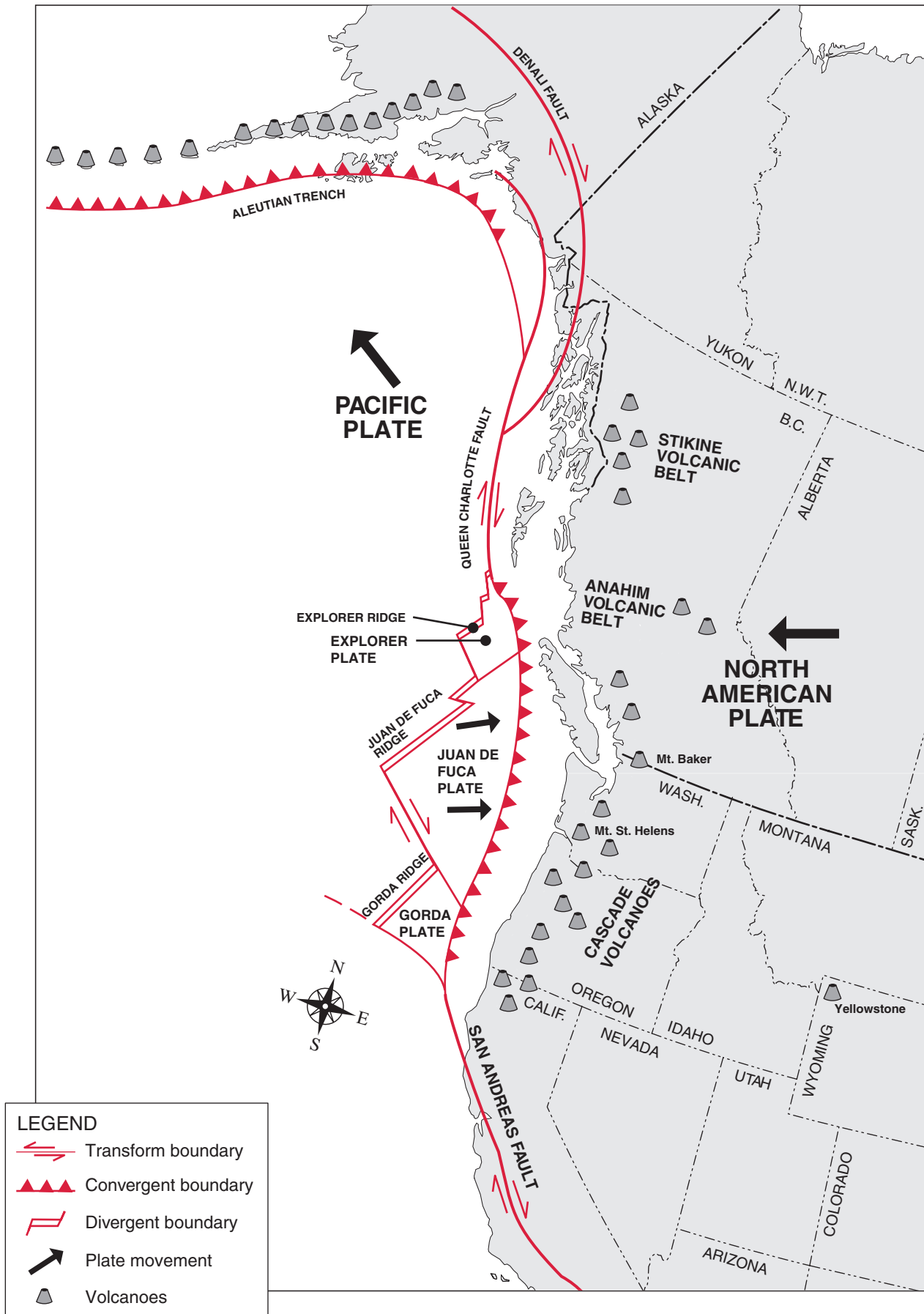
Data Page 8



THE NITROGEN CYCLE



MAP OF THE PACIFIC COAST OF NORTH AMERICA



TECTONIC PLATE BOUNDARIES MAP

